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Exposures to second-hand smoke lower than believed, ORNL study finds

OAK RIDGE, Tenn., Feb. 7, 2000 - Exposures to environmental tobacco smoke may be lower than earlier studies indicated for bartenders, waiters and waitresses, according to a study conducted by researchers at the Department of Energy's Oak Ridge National Laboratory (ORNL).

"While people who work as wait staff and bartenders may generally be considered to be more highly exposed to environmental tobacco smoke, data from our study suggests that the situation is more complex," said Roger Jenkins of the Chemical and Analytical Chemistry Division.

The study, which involved 173 people employed at restaurants or taverns of varying sizes in the Knoxville area, concluded that exposures to respirable suspended particulate matter (RSP), for example, were considerably below limits established by the Occupational Safety and Health Administration (OSHA) for the workplace.

Subjects, who were non-smokers, wore pumps that sampled the air they were breathing while at work for a minimum of four hours. Researchers recorded a maximum RSP level of 768 micrograms per cubic meter. The OSHA standard for RSP is 5,000 micrograms per cubic meter over eight hours. Samples from the subjects were analyzed for ultraviolet absorbing and fluorescing particulate matter, solanesol, 3-ethenyl pyridine, nicotine and RSP.

Other constituents of environmental tobacco smoke, sometimes called second-hand smoke, also were not present in the levels previously thought, Jenkins said. For example, a study published in the Journal of the American Medical Association in 1993 concluded that average RSP levels were 117 and 348 micrograms per cubic meter for bars and restaurants, respectively, while the ORNL study found those levels to be 67 and 135, respectively.

While the higher estimates in earlier studies may be explained by the choice of the establishments in which the studies were conducted, another reason for the difference could be that today's ventilation systems are more efficient, Jenkins said.

The Knoxville study also showed that for bartenders who live with smokers, the away-from-work exposure is at least as important as the at-work exposure. And people who are highly exposed at home tend to be more highly exposed at work, probably because they don't avoid it as much, Jenkins said.

Jenkins' paper, "Determination of Exposure to Environmental Tobacco Smoke in Restaurants and Tavern Workers in One U.S. City," is scheduled to be published in

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this month's issue of Journal of Exposure Analysis and Environmental Epidemiology.

The "Restaurant and Tavern Workers" study builds upon findings of an earlier ORNL study involving 16 cities and more than 1,500 subjects nationwide. In that study, test subjects wore separate air sampling devices at work and away from work over a 24-hour period. Results from this approach differ dramatically from stationary air sampling, which does not take into account the constantly changing conditions as people move from place to place throughout the day, Jenkins said.

"The fact is that while individuals may live or work in environments where there is smoke, stationary monitors cannot take into account changes in smoke exposure resulting from changes in a person's micro-environment," Jenkins said. "In these micro-environments, a person may be closer to or farther away from various sources of environmental tobacco smoke."

Over the last six or seven years, more data on personal exposure to tobacco smoke has become available and the methods for measuring and analyzing the smoke have become more sophisticated.

The 16-cities study, the largest of its kind ever conducted in a single country, found the highest levels of environmental tobacco smoke nicotine levels in workplaces where smoking is permitted to be between 9.41 and 14.9 micrograms per cubic meter, far lower than the numbers assumed by EPA and OSHA.

"A well-known toxicological principle is that the poison is in the dose," Jenkins said. "It's pretty clear that the environmental tobacco smoke dose is pretty low for most people."

Extensive controls were employed in collecting and analyzing the air samples collected by the 1,564 participants in the study, Jenkins said. Test subjects also submitted to saliva tests that would reveal cotinine, a constituent of tobacco smoke. Smokers were excluded from the study.

Cities used for the study were Baltimore; Boise, Idaho; Buffalo; Columbus, Ohio; Daytona Beach, Fla.; Fresno, Calif.; Grand Rapids, Mich.; Indianapolis; Knoxville; New Orleans; Philadelphia; Phoenix; Portland, Maine; San Antonio, Texas; Seattle and St. Louis.

A book that delves into this work, "The Chemistry of Environmental Tobacco Smoke: Composition and Measurement: Second Edition," is expected to be released in March. Co-writers are Jenkins, Mike Guerin and Bruce Tomkins of the Chemical and Analytical Sciences Division.

Authors of the restaurants and tavern workers study are Jenkins, Mike Maskarinec and Amy Dindal of the Chemical and Analytical Sciences Division and Richard Counts of the Computer Science and Mathematics Division.

The research was funded by the Center for Indoor Air Research. ORNL is a DOE multiprogram research facility managed by Lockheed Martin Energy Research Corporation.

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